CLAIMS

What is claimed is:

1. An orthogonal frequency division multiplexing (OFDM)-based synchronization detection apparatus, comprising:

m registers which store input data;

m shifters which shift outputs of the registers by as many as an exponent of a 2ⁿ-level quantized correlation coefficient for synchronization detection (n is an integer not less than 0); an adder which adds outputs of the shifters; and a peak detector which detects a peak value among the outputs of the adder.

- 2. The apparatus of claim 1, wherein the 2^n -level quantized correlation coefficient is obtained by proportionally scaling up a correlation coefficient using 2^n and approximating the scaled-up correlation coefficient to $\pm 1/2^i$ (i = 0, 1, ..., n).
- 3. The apparatus of claim 2, wherein in the scaling up the correlation coefficient, a correlation coefficient c*(m) is normalized using an equation $x = \frac{2^n c^*(m)}{\max c^*(m)}$.
- 4. The apparatus of claim 3, wherein in the approximating the scaled-up correlation coefficient, the normalized value x is approximated to a predetermined value Q_L and

$$Q_L[x] = \begin{cases} 2^{\lfloor \log_2 x \rfloor}, & x > 0 \\ -2^{\lfloor \log_2 (-x) \rfloor}, & x < 0 \end{cases} \text{ (where } \lfloor \log_2 x \rfloor \text{ indicates an integer closest to } \log_2 x \text{)}.$$

$$0, x = 0$$

5. An OFDM-based synchronization detection method, comprising: quantizing correlation coefficients for synchronization detection into 2ⁿ-level quantized correlation coefficients (n is an integer not less than 0);

shifting input data using the 2ⁿ-level quantized correlation coefficients to determine shifting results; and

detecting synchronization using the shifting results.

6. The method of claim 5, wherein in the shifting the input data, the input data is shifted by a predetermined number of bits, which is the exponent of the 2n -level quantized correlation coefficient.

7. The method of claim 5, wherein the quantizing a correlation coefficient comprises:

scaling up the correlation coefficient using 2^n ; and approximating the scaled-up correlation coefficient to +/- 2^i (I = 0, 1, ..., n).

- 8. The method of claim 7, wherein in the scaling up the correlation coefficient, a correlation coefficient c*(m) is normalized using an equation $x = \frac{2^n c^*(m)}{\max c^*(m)}$.
- 9. The method of claim 8, wherein in approximating the scaled-up correlation coefficient, the normalized value x is approximated to a predetermined value Q_L and

$$Q_L[x] = \begin{cases} 2^{\lfloor \log_2 x \rfloor}, & x > 0 \\ -2^{\lfloor \log_2 (-x) \rfloor}, & x < 0 \end{cases}$$
 (where $\lfloor \log_2 x \rfloor$ indicates an integer closest to $\log_2 x$).

- 10. The method of claim 5, wherein the detecting the synchronization comprises: adding the shifting results to produce adding results; and detecting a peak value among the adding results.
- 11. An orthogonal frequency division multiplexing (OFDM)-based synchronization detection apparatus, comprising:

an input register storing data;

a shifter wherein data from the input register is shifted based on an exponent of a quantized correlation coefficient;

an adder wherein the shifted data is summed; and

a peak detector wherein a peak value is determined from the summed shifted output for synchronization detection.

12. The apparatus of claim 11, further comprising

a 2ⁿ level quantizer, wherein a standard correlation coefficient is quantized into a 2ⁿ level, wherein the quantized correlation coefficient is determined.

- 13. The apparatus of claim 12, wherein the 2ⁿ level quantizer approximates the standard correlation coefficient by scaling the correlation coefficient, c*(m), into discrete levels by rounding normalized correlation coefficients to the nearest whole integer represented by 2ⁿ.
- 14. The apparatus of claim 12, wherein a table of quantized correlation coefficients is stored to use in shifting the data left by the number of bits in the exponent of the corresponding quantized correlation coefficient.
- 15. The apparatus of claim 12, wherein the maximum quantization level is greater than or equal to 2^2 .
- 16. The apparatus of claim 12, wherein the input register further comprises individual registers that each store a sample of the data.
- 17. The apparatus of claim 16, wherein the data samples move to the next register upon a clock cycle.
- 18. The apparatus of claim 17, wherein the data samples are output to the shifter after sixteen clock cycles.
- 19. A method of synchronization detection in an orthogonal frequency division multiplexing (OFDM) receiver comprising:

storing input data in a register;

calculating a quantized correlation coefficient from a standard correlation coefficient based on 2ⁿ level;

shifting the input data using a number of bits corresponding to an exponent of the quantized correlation coefficient;

adding the shifted input data; and

scanning the adding the shifted input data for a peak value wherein synchronization is detected.

20. The method of claim 19, wherein the calculating the quantized correlation coefficient includes

normalizing a standard correlation coefficient; and rounding the normalized standard correlation coefficient to the nearest whole integer represented by $2^{\rm n}$.